§ 963.14 Preclosure suitability criteria.

DOE will evaluate preclosure suitability using the following criteria:

(a) Ability to contain radioactive material and to limit releases of radioactive materials;

(b) Ability to implement control and emergency systems to limit exposure to radiation;

(c) Ability to maintain a system and components that perform their intended safety functions; and

(d) Ability to preserve the option to retrieve wastes during the preclosure period.

§ 963.15 Postclosure suitability determination.

DOE will apply the method and criteria described in §§ 963.16 and 963.17 to evaluate the suitability of the Yucca Mountain site for the postclosure period. If DOE finds that the results of the total system performance assessments conducted under § 963.16 show that the Yucca Mountain site is likely to meet the applicable radiation protection standard, DOE may determine the site suitable for the postclosure period.

§ 963.16 Postclosure suitability evaluation method.

(a) DOE will evaluate postclosure suitability using the total system performance assessment method. DOE will conduct a total system performance assessment to evaluate the ability of the geologic repository to meet the applicable radiation protection standard under the following circumstances:

(1) DOE will conduct a total system performance assessment to evaluate the ability of the Yucca Mountain disposal system to limit radiological doses and radionuclide concentrations in the case where there is no human intrusion into the repository. DOE will model the performance of the Yucca Mountain disposal system using the method described in paragraph (b) of this section and the criteria in § 963.17. DOE will consider the performance of the system in terms of the criteria to evaluate whether the Yucca Mountain disposal system is likely to comply with the applicable radiation protection standard.

(2) DOE will conduct a separate total system performance assessment to evaluate the ability of the Yucca Mountain disposal system to limit radiological doses in the case where there is a human intrusion as specified by 10 CFR 63.322. DOE will model the performance of the Yucca Mountain disposal system using the method described in paragraph (b) of this section and the criteria in § 963.17. If required by applicable NRC regulations regarding a human intrusion standard, § 63.321, DOE will consider the performance of the system in terms of the criteria to evaluate whether the Yucca Mountain disposal system is likely to comply with the applicable radiation protection standard.

(b) In conducting a total system performance assessment under this section, DOE will:

(1) Include data related to the suitability criteria in § 963.17;

(2) Account for uncertainties and variabilities in parameter values and provide the technical basis for parameter ranges, probability distributions, and bounding values;

(3) Consider alternative models of features and processes that are consistent with available data and current scientific understanding, and evaluate the effects that alternative models would have on the estimated performance of the Yucca Mountain disposal system ;

(4) Consider only events that have at least one chance in 10,000 of occurring over 10,000 years;

(5) Provide the technical basis for either inclusion or exclusion of specific features, events, and processes of the geologic setting, including appropriate details as to magnitude and timing regarding any exclusions that would significantly change the dose to the reasonably maximally exposed individual;

(6) Provide the technical basis for either inclusion or exclusion of degradation, deterioration, or alteration processes of engineered barriers, including those processes that would adversely affect natural barriers, (such as degradation of concrete liners affecting the pH of ground water or precipitation

of minerals due to heat changing hydrologic processes), including appropriate details as to magnitude and timing regarding any exclusions that would significantly change the dose to the reasonably maximally exposed individual;

(7) Provide the technical basis for models used in the total system performance assessment such as comparisons made with outputs of detailed process-level models and/or empirical observations (for example, laboratory testing, field investigations, and natural analogs);

(8) Identify natural features of the geologic setting and design features of the engineered barrier system important to isolating radioactive waste;

(9) Describe the capability of the natural and engineered barriers important to isolating radioactive waste, taking into account uncertainties in characterizing and modeling such barriers;

(10) Provide the technical basis for the description of the capability of the natural and engineered barriers important to isolating radioactive waste;

(11) Use the reference biosphere and reasonably maximally exposed individual assumptions specified in applicable NRC regulations; and

(12) Conduct appropriate sensitivity studies.

§ 963.17 Postclosure suitability criteria.

(a) DOE will evaluate the postclosure suitability of a geologic repository at the Yucca Mountain site through suitability criteria that reflect both the processes and the models used to simulate those processes that are important to the total system performance of the geologic repository. The applicable criteria are:

(1) Site characteristics, which include:

(i) Geologic properties of the site—for example, stratigraphy, rock type and physical properties, and structural characteristics;

(ii) Hydrologic properties of the site—for example, porosity, permeability,moisture content, saturation, and potentiometric characteristics;

(iii) Geophysical properties of the site—for example, densities, velocities and water contents, as measured or deduced from geophysical logs; and

(iv) Geochemical properties of the site—for example, precipitation, dissolution characteristics, and sorption properties of mineral and rock surfaces.

(2) Unsaturated zone flow characteristics, which include:

(i) Climate—for example, precipitation and postulated future climatic conditions;

(ii) Infiltration—for example, precipitation entering the mountain in excess of water returned to the atmosphere by evaporation and plant transpiration;

(iii) Unsaturated zone flux—for example, water movement through the pore spaces, or flowing along fractures or through perched water zones above the repository;

(iv) Seepage—for example, water dripping into the underground repository openings from the surrounding rock.

(3) Near field environment characteristics, which include:

(i) Thermal hydrology—for example, effects of heat from the waste on water flow through the site, and the temperature and humidity at the engineered barriers.

(ii) Near field geochemical environment—for example, the chemical reactions and products resulting from water contacting the waste and the engineered barrier materials.

(4) Engineered barrier system degradation characteristics, which include:

(i) Engineered barrier system component performance—for example, drip shields, backfill, coatings, or chemical modifications, and

(ii) Waste package degradation—for example, the corrosion of the waste package materials within the near-field environment.

(5) Waste form degradation characteristics, which include:

(i) Cladding degradation—for example, corrosion or break-down of the cladding on the spent fuel pellets;

(ii) Waste form dissolution—for example, the ability of individual radionuclides to dissolve in water penetrating breached waste packages.